12JAN12

2 HOUR DELAY

9:50AM ⇒ 10:50AM

• Day 72 •

- HW ✓ & Q & A w/ WARM-UPS
- Area between curves ("vertical")
- 1st FTC review ML
- 2nd FTC
- Homework Assignment

SCAN #6

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(1) 88. Let $F(x)$ be an antiderivative of $\dfrac{(\ln x)^3}{x}$. If $F(1)=0$, then $F(9)=$

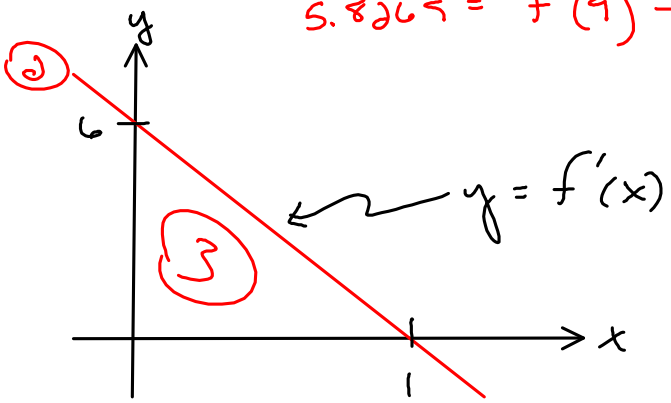
(A) 0.048 (B) 0.144 (C) 5.827 (D) 23.308 (E) 1,640.250

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

$$\int_1^9 \frac{(\ln x)^3}{x}\,dx = F(9) - F(1)$$

$$5.827 = F(9) - 0$$

(2)



if $f(0)=5$, then $f(1)=$

$$\int_a^b f'(x)\,dx = f(b) - f(a)$$

$$\int_0^1 f'(x)\,dx = f(1) - f(0)$$

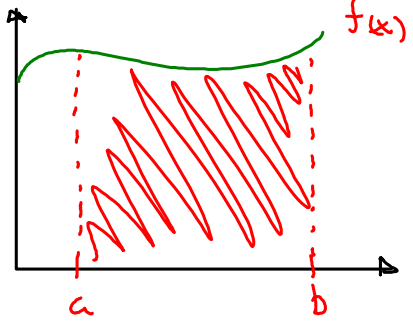
$$3 = f(1) - 5$$

$$\boxed{f(1) = 8}$$

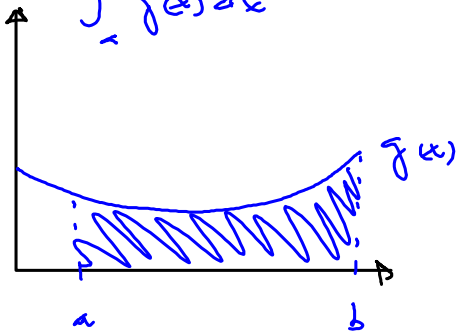
Integration: The Area Between 2 Curves

Two arbitrary curves

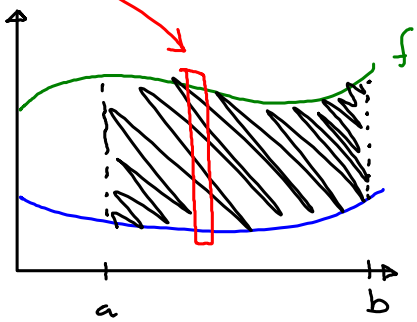
$\int_a^b f(x)dx$



$\int_a^b g(x)dx$



I NEED TO SEE THIS!



$$\underbrace{\int_a^b f(x)dx - \int_a^b g(x)dx}_{\int_a^b [f(x) - g(x)]dx}$$

general integration rule: top minus bottom from left to right

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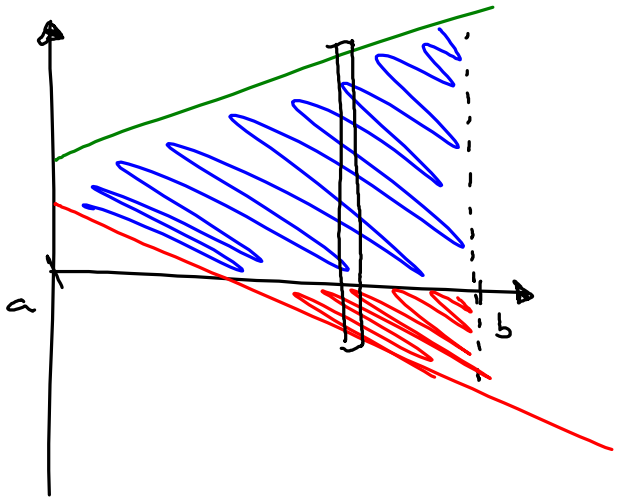
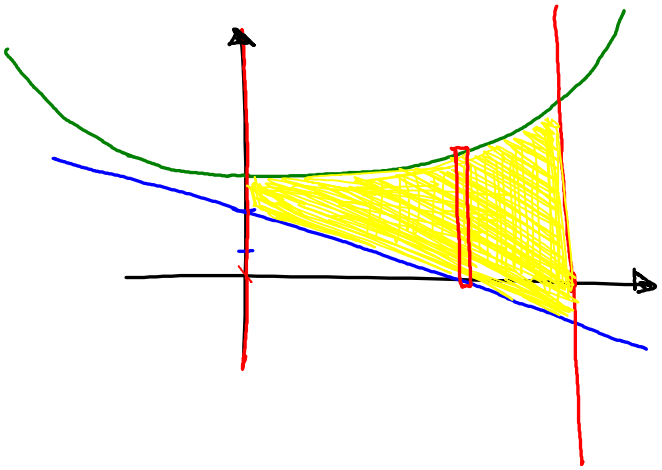
Cases where the graph is below the horizontal axis



⇒ find the area between the two functions from $x=0$ to $x=6$

$f(x) = -\frac{1}{2}x + 2$ ← bottom

$g(x) = \frac{1}{10}x^2 + 4$ ← top



$$\int_0^6 [\, g(x) - f(x) \,]\, dx$$

$$\int_0^6 \left[\left(\frac{1}{10}x^2 + 4\right) - \left(-\frac{1}{2}x + 2\right) \right] dx$$

$$\int_0^6 \left(\frac{1}{10}x^2 + 4 + \frac{1}{2}x - 2\right) dx$$

$$\int_0^6 \left(\frac{1}{10}x^2 + \frac{1}{2}x + 2\right) dx$$

$$\frac{1}{30}x^3 + \frac{1}{4}x^2 + 2x \Big|_0^6$$

$$= [\quad\quad] - [\quad 0 \quad]$$

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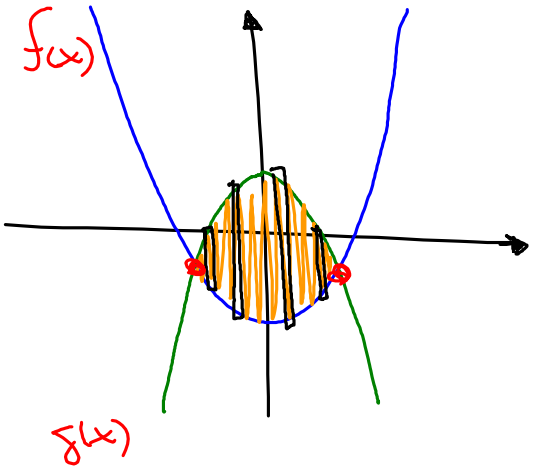
Using the TI to find intersections

$f(x) = x^2 - 4$

$g(x) = -x^2 + 2$

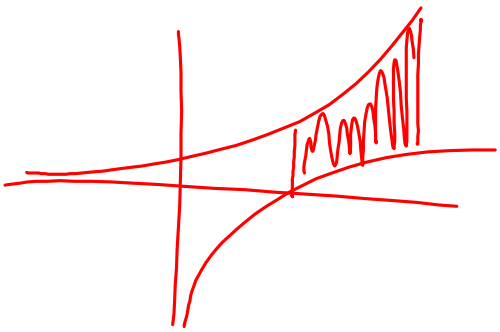


$f(x) = g(x)$

$x^2 - 4 = -x^2 + 2$

$2x^2 = 6$

$x^2 = 3 \Rightarrow x = \pm\sqrt{3}$

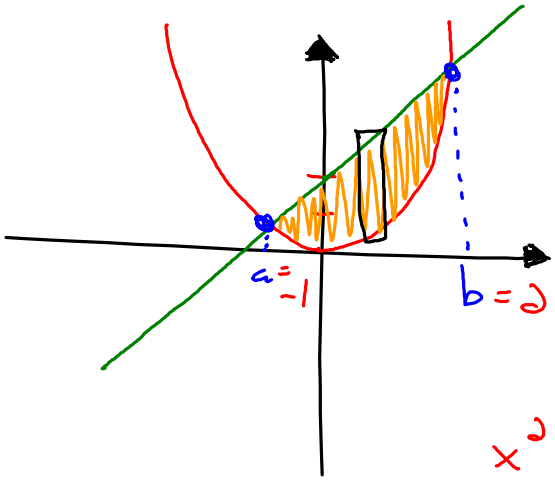


$$\int_{-\sqrt{3}}^{\sqrt{3}} [\, g(x) - f(x) \,]\, dx$$

The area bounded by 2 curves

find the area bounded by $y = x^2$ & $y = x + 2$

$y = x^2$ bottom, $y = x + 2$ top



$$\int_{-1}^{2} \left[(x+2) - (x^2) \right] dx$$

$$x^2 = x + 2$$

$$x^2 - x - 2 = 0$$

$$(x-2)(x+1) = 0$$

$2 \quad -1$

$$\int_{-1}^{2} (x + 2 - x^2)\, dx = \frac{x^2}{2} + 2x - \frac{x^3}{3} \Big|_{-1}^{2}$$

$$= \left[\frac{(2)^2}{2} + 2(2) - \frac{(2)^3}{3} \right] - \left[\frac{(-1)^2}{2} + 2(-1) - \frac{(-1)^3}{3} \right]$$

$$= \left[2 + 4 - \frac{8}{3} \right] - \left[\frac{1}{2} - 2 + \frac{1}{3} \right]$$

$$= 6 - \frac{8}{3} - \frac{1}{2} + 2 - \frac{1}{3}$$

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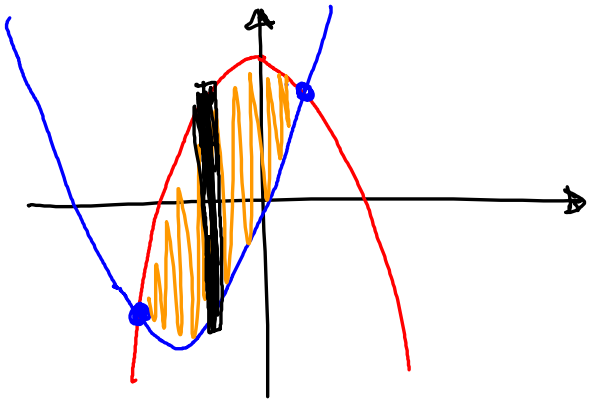
$$\frac{15}{2} - \frac{9}{3} = \frac{15}{2} - 3 = \frac{9}{2}$$

⇒ find the area bounded by

$y = x^2 + 5x$ and $y = 3 - x^2$

1. draw a sketch
2. find the intersections → left & right bounds
3. construct the integral
4. evaluate



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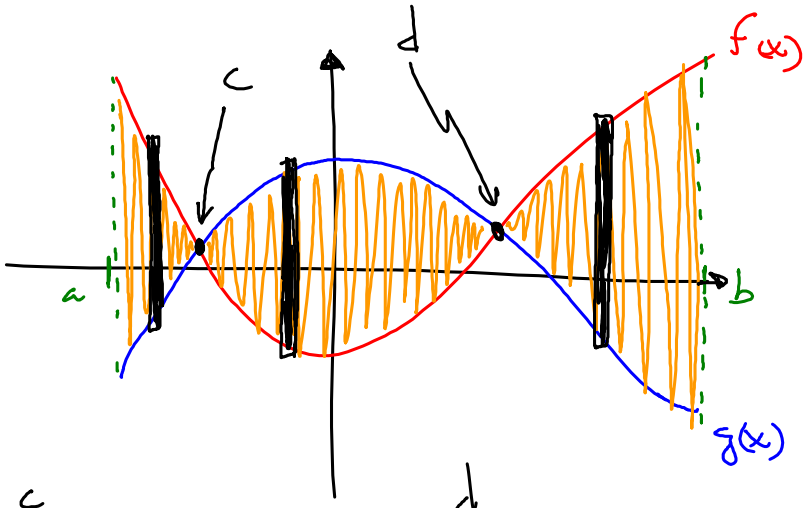
Sometimes you need to break up the integral into parts...



$$\int_a^c \left[f(x) - g(x)\right] dx + \int_c^d \left[g(x) - f(x)\right] dx + \int_d^b \left[f(x) - g(x)\right] dx$$

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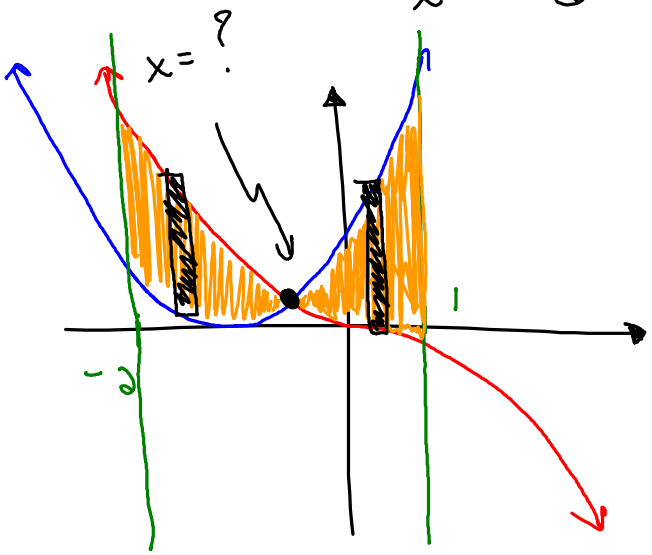
$y = x^2 + 2x + 1$

$y = -x^3$

$x = -2 \quad , \quad x = 1$

(break it into 2 parts)



★Homework Assignment★

- Homework worksheet for Area of a Bounded Region
  DUE MONDAY
- READ & TAKE NOTES Physics HRW Chapter 7
  DUE TUESDAY
- Larson p. 293 #'s 68, 70, 72, 73
  DUE MONDAY optional

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